Washington Latin -- A.P. Calculus

Review Topics, Techniques and Tips

for the A.P. Exam

1. Don’t forget your good friends:



2. The slope of a line or segment is:

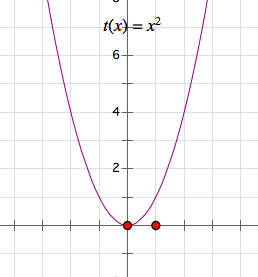
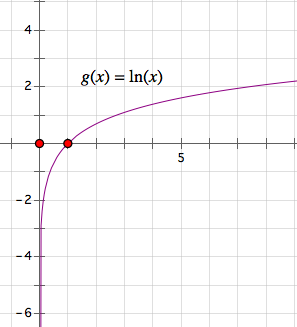


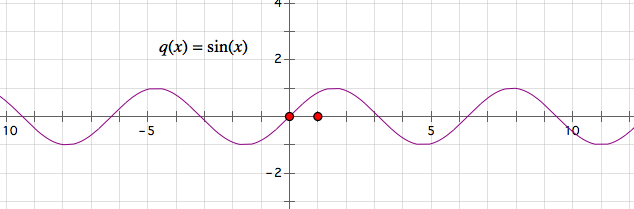
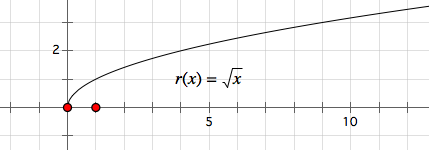
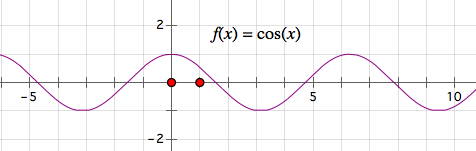
Equation of a line: ,

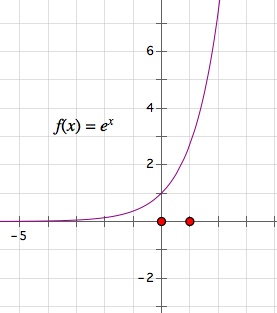
but for the Calculus, we like point-slope form:

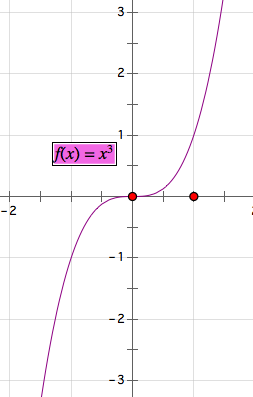


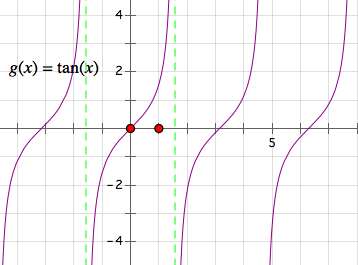
3. Be able to picture in your mind, **graphs** of all basic functions.

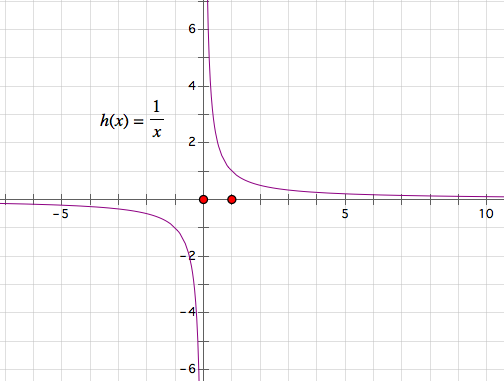
 











4. The greatest integer function defines *y* as the greatest integer, less than or equal to *x*. As examples, *f(2) = 2, f(2.5) = 2, f(2.9) = 2. f(3) = 3*.

5. Know **perimeters**, **areas** and **volumes** of basic geometric forms, or be able to figure them out:

|  |  |  |  |
| --- | --- | --- | --- |
| SHAPE | PERIMETER | SURFACE AREA | VOLUME |
| **Square** | *4S* | *S2* |  |
| **Rectangle** | *2L + 2W* | *LxW* |  |
| **Parallelogram** | *2B + 2S* | *BxH* |  |
| **Trapezoid** | *A + B + C + D* |  |  |
| **Triangle** | *A + B + C* |  |  |
| **Circle** | *2πR* | *πR2* |  |
| **Cylinder** |  | *2π R2 + 2πRH* | *πR2 H* |
| **Cone** |  |  |  |
| **Sphere** |  |  |  |

6. To solve a **quadratic**, put all terms on one side of the equation and set it equal to zero.

**FACTOR**, if possible.

For , find two numbers, *m* and *n*, that add up to b and multiply to c. Then



If not, use the **quadratic formula**:



7. When taking square roots, always use **±** .

8. Whatever your technique, you must be fluent in the unit circle and know the function values for all cardinal angles. (0, , , ,  and multiples of those.)

9. Know the following trig identities:

10. 20! means 20 **factorial**, = *20x19x18x17x … x2x1*

11. **Distance formula**:

The distance between two points in the *xy* - coordinate plane,  and , is;



It is the Pythagorean Theorem applied.

12. **Intermediate value theorem**

The intermediate value theorem says that if a function *f(x)* is continuous on any interval *[A, B],* for any *y -* value, *yn*, between *f(A)* and *f(B),* there is at least one *x* - value, *xn*, between *A* and *B ( A< xn* <*B* ) such that *f(xn)= yn*.

13. Finding **limits**, try in the following order:

1. Plug in the value

2. Manipulate the expression so that you can plug in the value

3. Use a conjugate

4. If the limit is at ∞, use end behavior analysis

5. Use our special limits

6. If you have an indeterminate form, use **l’Hopital’s Rule.**

Remember the special limits:



14. A derivative is the **limit of the Difference Quotient**:

15. Know all the **derivatives** of our basic parent functions.

16. Rules of differentiation:



17. Chain rule, **chain rule**, chain rule.



18. **Product Rule**



19. **Quotient Rule**



20. Derivative of the inverse function

21. Beware the difference between

Distance and Displacement

Speed and Velocity

Displacement and velocity are **VECTORS**, speed and distance are **SCALARS**.



→ If velocity and acceleration have the same sign, speed is increasing, the elephant is going **faster**.

→ If velocity and acceleration have opposite signs, speed is decreasing, the elephant is going **slower**.

22. Definition of **continuity** of*f(x)*at*x = a*:

1. the limit exists, 

2. the function value exists, , and

3. the two are equal .

23. **DIFFERENTIABILITY IMPLIES CONTINUITY**

24. **First derivative test**, for determining where a function has a maximum or a minimum.

1. Find the derivative and set it equal to zero, solve.

2. Assess whether *y’*  to the left and the right of the zero is positive or negative.

3. Where y’ goes from positive to zero to negative, there is a maximum. Where y’ goes from negative to zero to positive, there is a minimum.

4. Assess the **endpoints** if you have a closed interval.

25. **Second derivative test**, for finding maximums and minimums.

1. Find the derivative and set it equal to zero. Solve.

2. Find the second derivative.

3. At each point where the first derivative has a zero, evaluate the second derivative.

4. If the second derivative is **negative**, the function is concave down, and the point is a maximum. If the second derivative is **positive**, the function is concave up, and the point is a minimum.

26. Linear Approximation:

27. Concavity and Points of inflection

28. With **related rates**, do not plug in values until after differentiating.

29. **Mean Value Theorem** (Rolle’s Theorem)

For any function that is differentiable on an interval [A, B], there is some *x* - value, *xn*, between *A* and *B (A< xn <B),* such that the instantaneous rate of change at *xn* is equal to the average rate of change across the interval.

mathematically, 

graphically

30. Look for maximums and minimums where *y’ = 0,* and at **ENDPOINTS** of an interval.

31. Optimization

32. Differential Equations

33. Reimann Sums

34. Trapezoid Rule

35. Mean Value Theorem for Integrals

36. Average Value of a function:



37. Integral as Total accumulation

38. Area between curves

39. Volumes by integration

40. **Fundamental theorem** problems.





and don’t forget the chain rule



If the problem reads,

